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| 10/543,166 | 07/22/2005 | Hideki Yamanaka | ISH-0234 | 7946 |

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RADER FISHMAN & GRAUER PLLC
LION BUILDING
1233 20TH STREET N.W., SUITE 501
WASHINGTON, DC 20036

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| EXAMINER |
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ABOULFAIDA, AMBER

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| ART UNIT | PAPER NUMBER |
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2891

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10/05/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/543,166

Applicant(s)

YAMANAKA ET AL.

Examiner

Amber V. Aboulfaida

Art Unit

2891

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 July 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 July 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

2. Claim 4 is rejected under 35 U.S.C. § 112, second paragraph, because it is directed to both manufacture and a process of using the manufacture. As a result, the scope of the claim cannot be determined. See *Ex parte Lyell*, 17 USPQ2d 1548 (Bd. Pat. App. & Inter. 1990) (stating “a single claim which purports to be both a product or machine and a process is ambiguous and is properly rejected under 35 U.S.C. 112, second paragraph, for failing to particularly point out and distinctly claim the invention”); see, also, *IPXL Holdings v. Amazon.com, Inc.*, 430 F.2d 1377, 1384, 77 USPQ2d 1140, 1145 (Fed. Cir. 2005) (stating “it is unclear whether infringement of [the claim] occurs when one creates a system that allows the user to change the predicted transaction information or accept the displayed transaction, or whether infringement occurs when the user actually uses the input means to change transaction information or uses the input means to accept a displayed transaction. Because [the claim] recites both a system and the method for using that system, it does not apprise a person of ordinary skill in the art of its scope, and it is invalid under section 112, paragraph 2”); and see M.P.E.P. § 2173.05(p)II and the precedents cited therein.

Specifically, the claim is directed to a manufacture but the following limitations are directed to processes of using the manufacture: Claim 4, heat treatment in a hydrogen gas atmosphere, an argon gas atmosphere or an atmosphere of a mixture thereof.

Correction is required.

35 U.S.C. § 132(a) prohibits any "amendment [from] introduc[ing] new matter into the disclosure of the invention." Accordingly, new matter should not be introduced by either addition or deletion.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 4 is rejected under 35 U.S.C. § 101 as being non-statutory because it improperly embraces or overlaps two different statutory classes of invention, namely, manufacture and process of using the manufacture, which statutory classes are set forth only in the alternative in 35 U.S.C. § 101. See *Ex parte Lyell*, 17 USPQ2d 1548 (Bd. Pat. App. & Inter. 1990); see also M.P.E.P. 2173.05(p)II, and the precedents cited therein.

Specifically, the claim is directed to a manufacture but the following limitations are directed to processes of using the manufacture: Claim 4, heat treatment in a hydrogen gas atmosphere, an argon gas atmosphere or an atmosphere of a mixture thereof.

Correction is required.

35 U.S.C. § 132(a) prohibits any "amendment [from] introduc[ing] new matter into the disclosure of the invention." Accordingly, new matter should not be introduced by either addition or deletion.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-2, 4, 6 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by

Kendall '492.

a. Re claim 1, Kendall shows a silicon semiconductor substrate comprising: a {110} plane or a plane inclined from a {110} plane as a main surface of the substrate (Col. 4, ln. 57-62); and steps arranged at an atomic level along a <110> orientation on the main surface (Col. 6, ln. 33-37).

b. Re claim 2, Kendall shows that the pane inclined form the {110} plane is a plane inclined form the {110} plane toward a <100> orientation (Col. 4, ln. 57-62).

c. Re claim 4, Kendall shows a silicon semiconductor substrate having a plane inclined from the {110} plane toward the <100> orientation as the main surface (Col. 4, ln. 57-62).

d. Re claim 6, Kendall shows that an inclination angle of the silicon semiconductor substrate having the plane inclined from the {110} plane toward the <100> orientation as the main surface is 0 degree or more and less than 8 degrees (Col. 4, ln. 57-62).

e. Re claim 9, Kendall shows a manufacturing method for a silicon semiconductor substrate, comprising the steps of: preparing a silicon semiconductor substrate having a

plane inclined from a {110} plane toward a <100> orientation as a main surface (Col. 4, ln. 57-62), and heat treating (Col. 6, ln. 21-26) the silicon semiconductor substrate in an atmosphere of hydrogen, argon or a mixture thereof (Col. 10, ln. 23-25).

6. Claim 5 is rejected under 35 U.S.C. 102(b) as being anticipated by Sasaki '819.
 - a. Re claim 5, Sasaki shows a silicon semiconductor substrate having a plane inclined from a {100} plane toward a <100> orientation as a main surface (abstract), the substrate being polished (translation: [0028]).

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 3, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kizuki '952 in view of Kendall '492.

- a. Kizuki discloses a GaAs substrate comprising: a {110} plane or a plane inclined from a {110} plane as a main surface of the substrate (col. 2, ln. 39-41); and steps arranged at an atomic level along a <110> orientation on the main surface (col. 2, ln. 50). Kizuki also discloses that the plane inclined from the {110} plane is a plane inclined from the {110} plane toward a <100> orientation (Col. 2, ln. 40-41), and that a GaAs thin film is formed by means of an epitaxial growth method on the surface of the GaAs

substrate having the plane inclined from the {110} plane as the main surface (Col. 7, ln. 37-45). Therefore, Kizuki discloses a face centered cubic substrate with a 110 surface (i.e. GaAs) upon which epitaxial growth of the same material is performed to form a base. Hetro-epitaxial structures are formed on the base, which include quantum wires along ridges. Quantum wires are used in various optoelectronic devices.

b. Kizuki gives an example of a specific embodiment where face centered cubic substrate with a 110 surface (GaAs) is used, but doesn't expressly say that silicon can be used as an alternate material for the substrate.

c. Kendall discloses a semiconductor device with quantum wires/dots formed on a 110 substrate of materials expressly including GaAs and Si. Kendall therefore discloses that similar devices are formed, regardless of which face centered cubic material is used.

d. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have grown quantum wire devices such as those taught by Kizuki on a substrate of Si or GaAs, as taught by Kendall. One would have been motivated to do this depending on they type of device desired and the associated band gap requirements. For example, it would have been obvious to use a Si substrate to produce a Si/SiGe heterojunction for infrared photo detection.

4. The language, term, or phrase "formed by means of an epitaxial growth method", is directed towards the process of making a semiconductor device. It is well settled that "product by process" limitations in claims drawn to structure are directed to the product, per se, no matter how actually made. In re *Hirao*, 190 USPQ 15 at 17 (footnote 3). See also, In re *Brown*, 173 USPQ 685; In re *Luck*, 177 USPQ 523; In re *Fessmann*, 180 USPQ 324; In re *Avery*, 186 USPQ

Art Unit: 2891

161; In re *Wethheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); In re *Marosi* et al., 218 USPQ 289; and particularly In re *Thorpe*, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a “product by process” claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in “product by process” claims or otherwise. The above case law further makes clear that applicant has the burden of showing that the method language necessarily produces a structural difference. As such, the language “formed by means of an epitaxial growth method” only requires a silicon single crystal thin film on the silicon semiconductor substrate having the plane inclined from the {110} plane as the main surface, which does not distinguish the invention from Kizuki in view of Kendall, who teaches the structure as claimed.

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki '819 as applied to claim 5 above, and further in view of Ebara '336.

- a. Sasaki discloses claim 5, but fails to disclose an orientation flat with a <110> orientation.
- b. Ebara teaches a silicon wafer with a (100) orientation and an orientation flat with a (110) orientation.
- c. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the device of Sasaki have an orientation flat as taught with Ebara. One would have been motivated to do so for easy alignment in further processing steps.

6. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki '819 as modified by Kendall applied to claim 6 above, and further in view of Ebara '336.

- a. Sasaki as modified by Kendall discloses claim 5, but fails to disclose an orientation flat with a <110> orientation.
- b. Ebara teaches a silicon wafer with a (100) orientation and an orientation flat with a (110) orientation.
- c. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the device of Sasaki have an orientation flat as taught with Ebara. One would have been motivated to do so for easy alignment in further processing steps.

Response to Arguments

7. Applicant's arguments with respect to claims 1-10 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion


8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amber V. Aboulfaida whose telephone number is (571)-270-1558. The examiner can normally be reached on Monday through Friday 7:30 AM - 5:00 PM E.S.T..

Art Unit: 2891

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on 571-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

A.A.
September 25, 2007



B. WILLIAM BAUMEISTER
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800